

University of Groningen

The nearby field galaxy survey

Jansen, Rolf Arthur

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version

Publisher's PDF, also known as Version of record

Publication date:

2000

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Jansen, R. A. (2000). *The nearby field galaxy survey: a spectrophotometric study of 196 galaxies in the local field*. s.n.

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

The Nearby Field Galaxy Survey

**a spectrophotometric study of 196 galaxies
in the local field**



Cover:

Running from the near ultra-violet (365 nm, left on the back cover) to the far red (705 nm, right on the front cover) the integrated spectrum of irregular galaxy A11592+6237 is shown. It displays the relatively strong blue continuum and the nebular emission lines that are typical for actively star forming galaxies. A11592+6237 is a good example of a galaxy with a very large [O II]/H α ratio (chapter 4 of this thesis). [O II] (373 nm, violet) and H α (656 nm, red) are the two strongest emission lines seen in this spectrum.

The back cover also shows a gallery of the *B* filter (blue light) images of all galaxies observed in the Nearby Field Galaxy Survey. The images have been ordered according to their morphological type from left (early type: elliptical) to right (late type: irregular/peculiar), and according to their absolute blue magnitude from top (luminous) to bottom (faint). The apparent sizes of the galaxies in this gallery do not reflect their physical sizes: galaxies at the top left are 20 times bigger (~ 30 kpc, assuming $H_0=100$ km s $^{-1}$ Mpc $^{-1}$) than those at the lower right (1.5 kpc).

RIJKSUNIVERSITEIT GRONINGEN

The Nearby Field Galaxy Survey

**a spectrophotometric study of 196 galaxies
in the local field**

PROEFSCHRIFT

ter verkrijging van het doctoraat in de
Wiskunde en Natuurwetenschappen
aan de Rijksuniversiteit Groningen
op gezag van de
Rector Magnificus, Dr. D. F. J. Bosscher,
in het openbaar te verdedigen op
dinsdag 28 november 2000
om 13.15 uur

door

Rolf Arthur Jansen

geboren op 24 april 1969
te Vlissingen

Promotores: Prof. dr. M. Franx
Dr. D. G. Fabricant

Referent: Dr. N. Caldwell

Beoordelingscommissie:
Prof. dr. T. S. van Albada
Prof. dr. P. C. van der Kruit
Prof. dr. K. H. Kuijken

*It's tough
to make predictions,
especially about
the future.*

— *Yogi Berra.*
(free after Niels Bohr)

Contents

1	Introduction and Summary	11
1.1	Comparison of Distant and Nearby Galaxies	12
1.2	Limitations of Current Nearby Samples	12
1.3	Nearby Field Galaxy Survey Project Goals	13
1.4	Outline of this Thesis	13
1.4.1	<i>UBR</i> Surface Photometry	13
1.4.2	Nuclear and Integrated Spectrophotometry	14
1.4.3	[O II]: How Well Traceth the Tracer?	14
1.4.4	Quantifying Appearance	15
1.5	The Nearby Field Galaxy Survey and Beyond	15
1.5.1	Data in Hand	15
1.5.2	Observations in Progress	16
1.5.3	Future observations	16
2	Surface photometry of nearby field galaxies	19
2.1	Sample Selection	20
2.1.1	Merits and Limitations of the Sample	22
2.2	Observations, Reduction, and Calibration	28
2.2.1	Observations	28
2.2.2	Data Reduction	28
2.2.3	Calibration	29
2.2.4	Total Magnitudes: Extrapolation to Infinity	30
2.2.5	Evaluation of the Data Quality	30
2.3	Photometric Results	31
2.3.1	Data Presentation	31
	ATLAS OF IMAGES AND RADIAL PROFILES	33
2.3.2	Properties of Our Sample	50
2.4	Summary	54
2.A	Discussion of Individual Objects	61
2.B	Calibration of the Intensity Profiles	62
3	Spectrophotometry of nearby field galaxies	65
3.1	Observations and Data Reduction	66
3.1.1	Observations	66
3.1.2	Data Reduction	72

3.1.3	Flux Calibration, Deredshifting and Normalization	73
3.1.4	Measurement of Spectroscopic Indices	74
3.2	Spectrophotometric Accuracy	74
3.2.1	Evaluation of the Individual Sources of Error	74
3.2.2	Internal and External Checks of the Spectrophotometry	76
3.3	Spectrophotometric Results	79
3.3.1	Presentation of the Data	79
	ATLAS OF NUCLEAR AND INTEGRATED SPECTRA	79
3.3.2	Spectrophotometric Properties of the Sample	101
3.4	Summary	110
3.A	Discussion of Individual Objects	113
4	[O II] as tracer of current star formation	115
4.1	Variation in the [O II]/H α Ratio	116
4.1.1	Effects of Reddening by Dust	117
4.1.2	Effect of Excitation and Metallicity	119
4.2	Using [O II] and H α as Tracers of the SFR	120
4.2.1	Comparison with the Literature	120
4.3	Implications for H β as a SFR Tracer	121
4.4	Improved SFR Estimation and Empirical Corrections	122
4.5	Implications for Higher Redshifts	123
4.6	Summary	123
5	Quantitative morphology of nearby field galaxies	127
5.1	Technical Details	127
5.1.1	Sample selection	127
5.1.2	Observations	129
5.1.3	Data Reduction	129
5.1.4	Central concentration and rotational asymmetry	130
5.1.5	Discrete Sampling Effects	132
5.2	Results	133
5.3	Discussion	135
	Nederlandse samenvatting/Summary in Dutch	139
	Acknowledgements/Dankwoord	147
	Curriculum Vitae	149
	Publications	151

